HEALTH RISKS FROM CONTAMINATION OF THE RUTHERFORD BUILDINGS, UNIVERSITY OF MANCHESTER

SUMMARY FROM PROVISIONAL REPORT

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SUMMARY

This report summarises the findings from an independent inquiry that examined possible health risks from contamination of the Rutherford Buildings* at the University of Manchester. The inquiry was initiated at the request of Professor Alan Gilbert, President of the University, in response to concerns that cases of cancer among former occupants of the Buildings might be related to contamination by radioactive chemicals or mercury that had been used by Sir Ernest Rutherford and his colleagues in research carried out at the beginning of the 20th century. The investigation was conducted in collaboration with teams from the Health Protection Agency's Radiological Protection Division and the Health and Safety Laboratory, and was greatly assisted by input from current and former members of University staff.

Over the course of the investigation it became apparent that at least three cases of pancreatic cancer and two cases of brain cancer had occurred among people who had worked in the Rutherford Buildings. Also causing concern was a case of motor neuron disease. Review of the published scientific literature on these diseases confirmed that ionising radiation is an established cause of brain cancer in humans. Ionising radiation would also be expected to cause pancreatic cancer, although this has not been clearly demonstrable in epidemiological studies to date. Several studies have investigated a possible link between motor neuron disease and mercury, but findings have been inconsistent. There is no reliable epidemiological evidence that ionising radiation causes motor neuron disease. No indications were found of other known or suspected causes of the diseases that might have been encountered through work in the Rutherford Buildings.

Information about possible contaminants of the Rutherford Buildings was obtained from a history (compiled by Dr Neil Todd) of the research carried out by the Department of Physics during its occupation of the Buildings from 1900 to 1967; from a history (provided by the University) of the occupancy of the Buildings after 1967; from recollections offered by various current and former members of University staff; and by review of a) all retained reports of environmental surveys that had been carried out in the Buildings, b) risk assessments that had been carried out prior to remedial and construction projects, c) assessments that had been made of waste removed from the Buildings during remedial work, and d) archived records of the Health and Safety and Radiological Protection Committees.

This information indicated that between 1903 and 1919, the Department of Physics used radionuclides (radioactive forms of elements) from each of the three natural radioactive decay series (uranium-238, uranium-235 and throrium-232), and also substantial quantities of metallic mercury. Breakages and spillages were well documented. After 1919, when Rutherford left Manchester for Cambridge, taking his radioactive sources with him, the only new radioactive substances introduced into the Buildings appear to have been a small quantity of uranium used for research during World War 2, and possibly small quantities of tritium used by one or more medical departments during 1967-73. Apart from radionuclides and mercury, the only other hazardous contaminant identified was asbestos (mainly chrysotile, but also crocidolite and amosite), the presence of which had been documented in several environmental surveys.

* Taken to encompass all parts of what is now known as the Rutherford Building and adjoining buildings that were at one time occupied by the Department of Physics, and also their drains and an underground subway linking the Rutherford Building to the John Owens Building.

To gauge potential health risks from the identified contaminants, exposures were estimated for various reasonable worst-case scenarios, both historically and in the future. The main starting points for the exposure estimates were concentrations of the contaminants measured since 1999, both before and after remedial work to the Buildings. In addition, account was taken of the documented quantities of radionuclides that had been handled by the Department of Physics. Exposure estimates were collated with published data on the relation of relevant health outcomes to levels of exposure, to provide an assessment of risk.

The highest potential risk from contaminant radionuclides was that of lung cancer in long-term past occupants of the most polluted rooms of the Buildings. However, even after allowance for uncertainties in the assessment of historical exposures, the risk of lung cancer from past occupancy of the Buildings is expected to have been small (on average less than 60 excess deaths per 10,000 people, lower than this in non-smokers, and of similar order to the risk from passive smoking).

The excess risks of pancreatic and brain cancer from ionising radiation will have been substantially less than those for lung cancer (less than 1 excess death per 10,000 people).

Maximum potential risks of cancer from ionising radiation in future occupants of the Buildings, and in maintenance workers carrying out intrusive work on the fabric of the Buildings, were calculated to be lower than those in long-term past occupants.

It is unlikely that any harm to human health has occurred in the past 20 years, or will occur in the future, from mercury contamination of the Buildings. In the unlikely event that adverse effects did occur, (perhaps in an individual with relatively high exposures who was unusually susceptible) the impact would probably be minor (subtle cognitive changes and biochemical abnormalities in urine), and potentially reversible following cessation of exposure.

There is more uncertainty about risks from mercury contamination in earlier periods. However, any toxic effects from possibly higher exposures to mercury more than 20 years ago would have been present at the time, and would have tended if anything to resolve as exposures reduced.

Available measurements indicate that any exposure to asbestos through past occupancy of the Rutherford Buildings will have been extremely low, and the consequent lifetime excess risk of cancer in a long-term past occupant of the Buildings is estimated to be less than, and probably well below, 10 per 10,000.

Maintenance workers carrying out intrusive work have potential for higher exposures to asbestos. The main hazards that they face as a consequence of their exposure are lung cancer and pleural mesothelioma, and their risks of developing these diseases will be determined by their cumulative exposure to different forms of asbestos, including exposures from work at other locations as well as the Rutherford Buildings.

In general, any health risks from articles of furniture or furnishings that have been removed from the Rutherford Buildings will be trivial. Possible exceptions to this would be articles that were present in the Buildings before 1919, and articles that are visibly contaminated by mercury.

Theoretical considerations and the limited empirical data that are available suggest that there is no toxic interaction between the identified contaminants in the

Rutherford Buildings that could lead to elevations of risk importantly higher than those estimated for the contaminants individually.

On current evidence, none of the identified contaminants in the Rutherford Buildings could plausibly account for the cases of pancreatic cancer, brain cancer and motor neuron disease that have occurred among past occupants of the Buildings. In particular, the apparent cluster of pancreatic cancer cannot be explained by exposures to radionuclides, mercury or asbestos, either alone or in combination. By far the most likely explanation for the cluster is that it has occurred by chance coincidence.

Epidemiological research to clarify risks further is not a scientific priority. However, recommendations are made to explore further the chemical nature and origins of the mercury contamination in under-floor waste removed from the Rutherford Buildings during 2004-06, and also for limited additional monitoring of mercury levels in air. In addition, before carrying out any future intrusive maintenance work that will significantly disturb floor or wall materials, a radiological risk assessment should be made to determine whether control measures are needed to protect those involved in the work.

Given the low potential for risk, no form of health screening or other health intervention is recommended for people who may have been exposed to hazardous contaminants in the Rutherford Buildings.